REMARKS

This paper is being provided in response to the Office Action dated August 11, 2005, for the above-referenced application. In this response, Applicants have cancelled claims 5, 7, 14, and 17 and amended claims 1, 8 and 16 to clarify that which Applicants consider to be the invention. Applicants respectfully submit that the amendments to the claims are fully supported by the originally-filed specification.

The objection to the drawings has been made moot by cancellation of claims 5, 7, and 14 herein, the claims which recited the feature mentioned in connection with this objection. Accordingly, Applicants respectfully request that this objection be withdrawn.

The objection to claims 1-18 has been addressed by amendments to the claims provided herein in accordance with the guidelines set forth in the Office Action. Accordingly, Applicants respectfully request that this objection be withdrawn.

The rejection of claims 5, 7, and 14 under 35 U.S.C. 112, second paragraph, has been made moot by cancellation of those claims herein. Accordingly, Applicants respectfully request that this rejection be withdrawn.

The rejection of claims 1, 2, 4, 8-11, 13, 16 and 18 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,053,664 to Kikuta, et al. (hereinafter "Kikuta") in view of JP 11-146616 to Suzuki et al. (hereinafter "Suzuki") in further view of JP 02106152 A to Tanaka et

al. (hereinafter "Tanaka") is hereby traversed and reconsideration thereof is respectfully requested in view of the amendments to the claims contained herein.

Independent claim 1, as amended herein, recites a DC motor having a case and a rotor unit that is rotatably arranged within the motor and includes a single hollow cylindrical field magnet fixed to holder means into which a rotating shaft is press-fitted at a center thereof. The cylindrical field magnet is magnetized such that South and North poles alternate in a circumferential direction. A stator unit is arranged circumferentially around the rotor made of a ring arranged in the case and a plurality of stator yokes. The yokes are made of a large number of circumferentially-stacked thin plates, each of which is a salient pole, and to which is attached a plurality of coil units made by winding a magnetic wire on a bobbin. The rotor unit includes a holder fitted at one end of the field magnet and a spring holder mounted at the other end of the field magnet, the spring holder being composed of a second holder fitted at the other end of the field magnet, a third holder and a spring sandwiched between the second holder and the third holder. Each of the South and North poles has a plurality of stages formed in the axial direction, and are circumferentially shifted from each other by a predetermined shift amount, boundaries between the S poles and the N poles being formed in a stepped shape in parallel with an axis of the rotating shaft. Claims 2-4 and 6 depend on independent claim 1.

Independent claim 8, as amended herein, recites a DC motor having a case and a rotor unit that is rotatably arranged within the motor and that includes a single hollow cylindrical field magnet fixed to holder means in which a rotating shaft is press-fitted at a center thereof. The cylindrical field magnet is magnetized such that South and North poles alternate in a

circumferential direction thereof. A stator unit is circumferentially arranged around the rotor unit and includes a ring arranged in the case and a plurality of stator yokes so arranged as to oppose the cylindrical field magnet. Each of the stator yokes includes a large number of circumferentially-stacked thin plates each of which constitutes a salient pole, and a plurality of coil units. The rotor unit includes a holder fitted at one end of the field magnet and a spring holder mounted at the other end of the field magnet, the spring holder being composed of a second holder fitted at the other end of the field magnet, a third holder and a spring sandwiched between the second holder and the third holder. Each of the S and N poles has a plurality of stages in an axial direction and shifted from each other in the circumferential direction of the cylindrical field magnet with a predetermined shift amount, boundaries between the S poles and the N poles being formed in a stepped shape in parallel with an axis of the rotating shaft. Claims 8-13 and 15 depend from independent claim 8.

Independent claim 16, as amended herein, recites a DC motor having a case and a rotor unit which is rotatably arranged within the motor and includes a rotating shaft press-fitted to a sleeve. A single tubular field magnet and holders are arranged at both ends of the field magnet. The sleeve is secured on a portion of an inner periphery of the field magnet. The field magnet is magnetized such that South and North poles alternate with each other in a circumferential direction thereof, each of the South and North poles having a plurality of stages formed in an axial direction and shifted from each other in the circumferential direction of the cylindrical field magnet with a predetermined shift amount. The rotor unit includes a holder fitted at one end of the field magnet and a spring holder mounted at the other end of the field magnet. The spring holder is composed of a second holder fitted at the other end of the field magnet. A third holder

and a spring sandwiched between the second holder and the third holder. A stator unit is circumferentially arranged around the rotor unit and is comprised of a ring arranged in the case and a plurality of stator yokes so arranged as to oppose the cylindrical field magnet with a small gap, each of the stator yokes being formed by circumferentially stacking a large number of thin plates each of which constitutes a salient pole, and a plurality of coil units, each being formed by winding a magnet wire on a bobbin and mounted on each of the stator yokes. Claim 18 depends from claim 16.

Kikuta discloses a motor-driven fuel pump including a brushless motor; a motor housing for enclosing the brushless motor; and a pump section adapted to be driven by the brushless motor for sucking a fuel and pumping the same into the motor housing. The brushless motor includes a stator fixed to an inner circumference of the motor housing; a rotor assembly adapted to be rotated by supplying current to the stator, which rotor assembly includes a motor shaft, a rotor mounted to the motor shaft a rotor cover mounted to one end of the rotor magnet on the side of the pump section, a timing rotor mounted to the other end of the rotor magnet, and a sensor magnet mounted to an end of the timing rotor on the side opposite to the rotor magnet; an end cover mounted at an inlet end of the brushless motor; a motor shaft bearing mounted in the end cover for rotatably supporting the motor shaft; and a timing rotor bearing interposed between an outer circumference of the timing rotor and the inner circumference of the motor housing for rotatably supporting the timing rotor.

The Suzuki reference discloses a cylindrical motor structure including a rotor unit with a cylindrical rotor magnet 13. The rotor unit includes a salient pole 23 and a winding part formed

by adjusting its dimension in an axial direction and layered in the circumferential direction. An armature is arranged by inserting a coil 12 whose magnet wire is wound around the winding part of the salient pole and press-fitted to a stator 20. (See Abstract, Figures 1, 2 of Suzuki.)

The Office Action indicates that Tanaka discloses the use of a rotor having each of the South and North poles having a plurality of stages formed in an axial direction by a predetermined interval in order to reduce vibration and noise.

Applicants independent claims recite that the rotor unit includes a holder fitted at one end of the field magnet and a spring holder mounted at the other end of the field magnet, the spring holder being composed of a second holder fitted at the other end of the field magnet, and a third holder and a spring sandwiched between the second holder and the third holder. This feature is described in the present application and illustrated, for example, in FIG. 2B of the present application which shows a hollow field magnet (6) having a holder (12) fitted at one end and a spring holder (33) at the other end and including a second holder (18), a third holder (31) and a spring (32) sandwiched between the second holder and the third holder. As described in the present application, this structure reduces undesirable cogging so as to decrease vibration of the motor in a manner that minimizes adverse impact on torque and minimizes the complexity of the structure needed to this.

In contrast, none of the cited references show, teach, or suggest this recited feature. In all of the disclosed embodiments, Kikuta does not disclose any spring/holder combination at an end of the field magnet of the rotor assembly for any of the disclosed embodiments. The same is true for the Suzuki and Tanaka references. Thus, Applicants respectfully submit that Kikuta, Suzuki,

and Tanaka, taken alone or in combination, do not teach or fairly suggest at least the above-noted features as claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 3 and 12 under 35 U.S.C. 103(a) as being unpatentable over Kikuta in view of Suzuki in view of Tanaka and further in view of U.S. Patent No. 5,034,642 to Hoemann et al. (hereinafter "Hoemann") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Claims 3 and 12 depend from independent claims 1 and 8, respectively, discussed above.

The Kikuta, Suzuki, and Tanaka references are discussed above.

The Hoemann reference discloses a permanent magnet rotor and motor. The Office Action cites Hoemann as disclosing that a rotor position detection element is adjusted by one-half the shift amount of respective stages.

Applicants respectfully submit that the addition of the Hoemann reference fails to overcome the above-noted deficiencies of the Kikuta, Suzuki, and Tanaka references with respect to claims 1 and 8. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 5, 7, 14 and 15 under 35 U.S.C. 103(a) as being unpatentable over Kikuta in view of Suzuki in view of Tanaka and further in view of U.S. Patent No. 5,717,268 to Carrier et al. (hereinafter "Carrier") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Claims 5, 7 and 14 have been cancelled herein. Claim 15 depends from independent claim 8, discussed above.

The Kikuta, Suzuki, and Tanaka references are discussed above.

The Carrier reference discloses an electric motor with a tachometer signal generator. The Office Action cites Carrier as disclosing a DC brushless motor with an eight poles outer rotor and a six poles stator unit.

Applicants respectfully submit that the addition of the Carrier reference fails to overcome the above-noted deficiencies of the Kikuta, Suzuki, and Tanaka references with respect to claim 8. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claim 6 under 35 U.S.C. 103(a) as being unpatentable over Kikuta in view of Suzuki in view of Tanaka and further in view of U.S. Patent No. 4,998,032 to Burgbacher et al. (hereinafter "Burgbacher") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Claim 6 depends from independent claim 1, discussed above.

The Kikuta, Suzuki, and Tanaka references are discussed above.

The Burgbacher reference discloses a permanent magnet excited electric motor. The Office Action cites Burgbacher as disclosing a DC brushless motor with an eight poles inner rotor and a six poles stator unit.

Applicants respectfully submit that the addition of the Burgbacher reference fails to overcome the above-noted deficiencies of the Kikuta, Suzuki, and Tanaka references with respect to claim 1. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claim 17 under 35 U.S.C. 103(a) as being unpatentable over Kikuta in view of Suzuki in view of Tanaka and further in view of U.S. Patent No. 5,856,718 to Matsuchita et al. (hereinafter "Matsuchita") has been made moot by cancellation of claim 17 herein. However, Applicants note that this reference does not appear to disclose any holder fitted at one end of a field magnet as recited in the present independent claims but, instead, show a rotor shaft (4) fitted into a sleeve (5) which abuts a washer (7) which abuts a bearing (2).

Based on the above, Applicants respectfully request that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 508-898-8603.

Respectfully submitted,
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